Make Your Own Compass

North Pacific storm waves as seen from the M/V NOBLE STAR, Courtesy NOAA

"When neither sun nor stars appeared for many a day, they gave up hope. This was a terrible handicap to them because these ancient navigators had no compass nor any other instrument. The only way they could guide the ship was by the sun and stars. When they could not see them for many days they lost all knowledge of their whereabouts. They were drifting helplessly before a howling gale in the midst of a turbulent sea with no idea where they were headed."

~ from God and Shipwrecks *by Ray C. Stedman*
http://www.raystedman.org/acts/0450.html

One of the most important improvements to ocean navigation was the invention of the compass. There is some disagreement about who should get credit for this invention. It's pretty clear that the Chinese knew about magnetism as early as 2637 BC, but the first written description of a compass for navigation didn't appear in Europe until 1190. Why did it take so long? After you do this activity, you may have at least one good answer!

What You Will Need

- ❒ Sewing needle about one to two inches long
- ❒ Small bar magnet or refrigerator magnet
- ❒ A small piece of cork (corks from wine bottles work well, but not the plastic stoppers)
- ❒ A small glass or cup of water to float the cork and needle
- ❒ Pair of pliers

What You Will Do

Make a simple compass to find magnetic north or south, depending on where you live

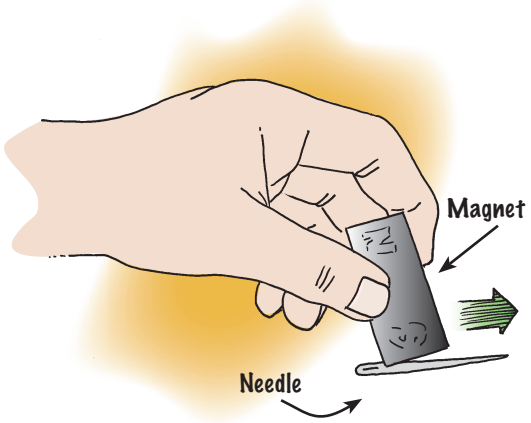
Warnings

1. Needles are sharp. Be careful!

2. Magnets can damage cards with a magnetic stripe (credit cards, library cards, school IDs, etc), floppy disks, and some electronic devices. Keep magnets away from these things.

How to Do It

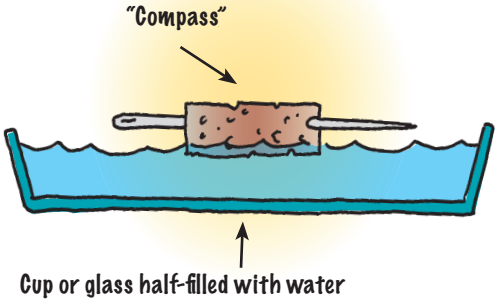
1. Rub a magnet over the needle a few times, always in the same direction. This action magnetizes the needle.



2. Cut off a small circle from one end of the cork, about 1/4-inch thick. Lay the circle on a flat surface.

3. Using a pair of pliers, carefully poke the needle into one edge of the circle and force the needle through the cork so that the end comes out the other side. Push the needle far enough through the cork so that about the same amount of needle is sticking out each side of the cork. Be careful not to stick yourself!

4. Fill the glass or cup about half full of water, and put the cork and needle assembly on the surface of the water.



5. Place your "compass" on a flat surface and watch what happens. The needle should point towards the nearest magnetic pole —north or south, depending upon where you live.

6. Try placing a magnet near your compass and watch what happens. How close does the magnet have to be to cause any effects? Try this again with a nail or other steel object. You can see why its's important to keep metal objects away from compasses on ships!

7. Imagine you are on the deck of a ship tossing back and forth on the open ocean. How well do you think your compass would work? When the cork floats on the water it creates a sort of low-friction bearing. This kind of bearing is essential to allow the needle to rotate in response to Earth's magnetic field. But a cup of water probably wouldn't last long on the deck of a rolling ship! The need for a sturdy low-friction bearing was one of the reasons that it took a long time for mariners to use compasses at sea, even though the basic principles had been known for centuries.

What's Happening

Magnetic fields are areas that contain a force created by moving electrical charges. Earth produces a magnetic field. This field is very weak, but it is sufficient to align magnetized objects—such as your needle—that are free to rotate. By floating the needle on the cork, you allow it to rotate freely so the needle becomes lined up with Earth's magnetic field, and points toward the north or south pole of the planet.